

## **The Claims:**

This listing will replace all prior versions, and listings, of claims in the application:

### **Listing of Claims:**

**1 (previously amended).** A laser device having a laser medium in a resonator cavity comprising:

- a) means for pumping energy into said laser medium to increase gain of said laser device;
- b) active Q-switch means having open and close states for controlling loss modulation of said resonator cavity; and
- c) passive Q-switch means for further controlling loss modulation of said resonator cavity, wherein loss modulation control from active and passive Q-switch means enable generation of a short width, high peak power pulse at a lasing wavelength.

**2 (original).** The laser device as claimed in Claim 1, wherein loss modulation effects of active and passive Q-switch means are timed to minimize cavity loss at which time a high peak power pulse is generated.

**3 (original).** The laser device as claimed in Claim 2, capable of generating high peak power pulse having a width ranging between from about 50ps to 10ns.

**4 (original).** The laser device as claimed in Claim 2, wherein when said active Q-switch means is in a closed state, said laser medium absorbs energy to a certain gain level.

**5 (original).** The laser device as claimed in Claim 2, wherein said passive Q-switch means saturates at a time after the active Q-switch enters an open state to enable generation of a high peak power pulse of short duration.

**6 (original).** The laser device as claimed in Claim 2, further comprising means for triggering the active Q-switch means to provide an open time window adjusted to avoid occurrence of sub-pulsing.

**7 (withdrawn).** The laser device as claimed in Claim 6, wherein said active Q-switch means comprises an acousto-optical (AO) device for controlling loss modulation at a predetermined pulse repetition frequency.

**8 (original).** The laser device as claimed in Claim 6, wherein said active Q-switch means comprises an electro-optical (EO) crystal for controlling loss modulation at a predetermined frequency.

**9 (withdrawn).** The laser device as claimed in Claim 2, wherein said active Q-switch means comprises a rotating chopper device having open slits for controlling loss modulation at a predetermined frequency.

**10 (original).** The laser device as claimed in Claim 2, wherein said laser medium is a solid-state laser material comprising one selected from the group comprising: Nd:YAG, and Nd:YV0<sub>4</sub>.

**11 (original).** The laser device as claimed in Claim 2, wherein said passive Q-switch means comprises a solid-state saturable absorber.

**12 (original).** The laser device as claimed in Claim 2, wherein said saturable absorber includes Cr<sup>4+</sup>:YAG.

**13 (original).** The laser device as claimed in Claim 11, wherein said solid-state laser material and said solid-state saturable absorber is physically bonded together.

**14 (original).** The laser device as claimed in Claim 10, wherein said solid-state laser material and said solid-state saturable absorber are integrated.

**15 (original).** The laser device as claimed in Claim 14, wherein said integrated solid-state laser material and said solid-state saturable absorber comprise a YAG crystal co-doped with Nd<sup>3+</sup> and Cr<sup>4+</sup>.

**16 ((previously amended)).** A hybrid Q-switch for a laser device having a laser medium being pumped with energy comprising:

a solid-state saturable absorber element for controlling loss modulation of said laser device;

an active Q-switch element having open and closed states for controlling loss modulation of said laser device and positioned in series with said laser medium and said absorber element; and

means for adjusting timing of said open and closed states of the active Q-switch element, wherein combined loss modulation control from active Q-switch and saturable absorber elements enable generation of a short width, high peak power pulse at a lasing wavelength.

**17 (original).** The hybrid Q-switch as claimed in Claim 16, wherein when said active Q-switch means is in a closed state, said laser medium absorbs energy to a certain gain level.

**18 (original).** The hybrid Q-switch as claimed in Claim 17, wherein said saturable absorber element saturates at a time after the active Q-switch enters an open state to enable generation of a high peak power pulse of short duration.

**19 (original).** The hybrid Q-switch as claimed in Claim 18, wherein an open state of said active Q-switch means is adjusted to avoid occurrence of sub-pulsing.

**20 (original).** The hybrid Q-switch as claimed in Claim 18, wherein said active Q-switch element includes an electro-optical crystal triggered to adjust time of said open and close states.

**21 (withdrawn).** The hybrid Q-switch as claimed in Claim 18, wherein said active Q-switch element includes an acousto-optical crystal triggered to adjust said open and close states and thereby control optical gain of said laser medium.

**22 (withdrawn).** The hybrid Q-switch as claimed in Claim 18, wherein said active Q-switch element includes a rotating chopper device having one or more slits each of predetermined width for adjusting time of said open and close states.

**23 (withdrawn).** The hybrid Q-switch as claimed in Claim 22, wherein a diameter of the chopper is less than about 12.0 cm in diameter.

**24 (withdrawn).** The hybrid Q-switch as claimed in Claim 22, wherein a width of each opening slit is larger than a diameter of a laser beam emitted by said laser device.

**25 (withdrawn).** The hybrid Q-switch as claimed in Claim 22, further including two overlapped identical choppers each having slits, said choppers having their slits crossover so that a final opening width is changeable by adjusting a degree of mutual crossover.

**26 ((previously amended)).** A method of operating a laser device having a laser medium comprising the steps of:

- a) pumping the laser medium to increase gain of said laser device;
  - b) controlling loss modulation of a resonator cavity of said device by active Q-switch means; and
  - c) controlling loss modulation of a resonator cavity by passive Q-switch means,
- wherein loss modulation control from active and passive Q-switch means enable generation of a short width, high peak power pulse at a lasing wavelength.

**27 (original).** The method as claimed in Claim 26 , further including the step of timing loss modulation effects of active and passive Q-switch means to minimize cavity loss.

**28 (original).** The method as claimed in Claim 26 , wherein said controlling loss modulation step b) includes:

closing said active Q-switch means for a time sufficient for said laser medium to absorb energy to a certain gain level.

**29 (original).** The method as claimed in Claim 26, wherein said absorber element saturates at a time after the active Q-switch enters an open state to enable generation of a high peak power pulse of short duration.

**30 (original).** The method as claimed in Claim 26, further comprising the step of: triggering the active Q-switch means to provide an open time window adjusted to avoid occurrence of sub-pulsing.